The Sampler

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Frog Mania

Why are malformities showing up in frogs?

Interview with Hilary Snook, DES Biomonitoring Program Coordinator

Hilary: On a world wide basis there's been a decline in frog populations. There's been research in the past trying to find out causes.

Stepanie: Are there theories why the frog population is declining?

Hilary: Many theories exist on the causes of declining frog populations. One theory is acid deposition. We are losing frogs in certain regions of the country at higher altitudes where there is a predominance of acid deposition. Deposition gets into snow pack; then when you have a melt, it creates an acid slug that runs off and basically wipes out or severely stresses a lot of the species. Declining populations have not been limited to high altitudes either. Species have been disappearing in tropical regions as well.

Stephanie: So they haven't necessarily related declines to lake quality, for example with more acidic lakes having more problems?

Hilary: It has been proven that there are significant seasonal acidic pulses that have had effects on some of the biota. In the western region of the country it appears to be related to elevation. There have been thoughts that part of it might be due to increasing exposure to ultra violet light (UV-B) as a result of the deterioration of the ozone layer.

Stephanie: Have you heard of a similar decline in other creatures like turtles?

Hilary: As far as population declines, I haven't. In salamanders and other amphibians they've been finding deformities. Population declines are also likely attributed to less open space and habitat alteration.

Stephanie: We've been hearing a lot about malformed frogs. What is the difference between a malformity and a deformity?

Hilary: A malformed frog is a frog that has certain anomolous morphological

see Watershed Survey on page 3

Holistic Lake Healing

Stephanie Moses, NHVLAP Coordinator

How can we protect our lakes from excess development? How much development is too much? Is the increase in plants in the lake natural or due to human impact? Is my lake ***stressed out*?**

New Hampshire and Vermont have joined forces to try their hands at holistic lake management, in hopes of answering some of these previously unanswerable questions. What this means is that traditional water tests describe the health of a lake in terms of what stage the lake is at in the overall aging process — they give us a snapshot of the lake's health at that moment. "Holistic" management will look to biological communities in the lakes — plankton, plants, and aquatic insects — to determine if lakes are under unnatural stress (bioassessment). Furthermore, biologists want to look at not only the health of lakes today, but also their health history, if you will, by studying lake sediments (paleolimnology).

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Connor's Corner

The New Hampshire Volunteer Lake Assessment Program (NHVLAP) proves each year how important volunteerism is throughout the United States. Through your efforts, approximately 120 lakes are evaluated on an annual basis. The result of this eleven-year program is the pronounced ability of biologists to evaluate lake quality trends and predict cause and effect relationships in the lake ecosystem.

To your credit, NHVLAP has developed into much more than just a lake monitoring program. Now, watershed monitoring and management has become an integral piece in the program. Many lake associations are developing diagnostic lake and watershed programs to locate nonpoint sources of pollution to the lake. The goal of such programs is to protect the lake quality by assessing the impacts of land-use activities around the lake and increased watershed development. Assessing nonpoint sources and developing best management practices is an important means of protecting the lake you live on. Each lake association should also develop a program of public awareness; the shoreline property owners are an essential part of any lake protection program. Develop programs to inform each property owner of priority lake protection issues and actions important to protecting the lake. And, keep Stephanie and I informed; we can help you determine what program may work for your association.

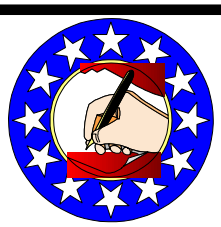
We encourage you all to participate in other volunteer programs that are offered. Programs like the *Secchi Dip In*, fish collection for mercury monitoring, *Weed Watchers*, education and diagnostic studies are all important programs for assessing potential problems of the lake and developing management programs to reduce the lake ageing process.

Welcome back to the 1997 NHVLAP Program. We wish you all a very prosperous and safe sampling year.

Jody Connor
Limnology Center Director

Legislative Update

Jody Connor, Limnology Center Director



Two important lake bills were sponsored in the House for the 1997 session. **HB 744** prohibits people from bringing boats from lakes contaminated with exotic species into clean lakes. Fish and Game was given the responsibility to post a notice at public access areas of the procedures for cleaning boats before they can be put into the water. The bill also requires DES to compile and publish a list of lakes that are contaminated with exotic species. Many of those who testified felt that the bill needed to be cleaned up. As a result of hearing testimony, the bill was referred to a study committee. The committee recommended that **HB 744** be referred for further study. This will allow the bill to re-introduced next session. The House study committee also agreed to extract some important pieces of this legislation and attach them to another House bill.

HB 181 originally prohibited the sale of exotic aquatic weeds in the state of New Hampshire. The bill was amended to include important sections of **HB 744**. **HB 181** was amended as follows: N o exotic aquatic weeds shall be offered for sale, distributed, sold, imported, purchased, propagated, transported, or introduced into the state. This bill is particularly important because it allows DES to develop an emergency response protocol to treat new exotic weed infestations. Another important feature allows DES to designate new small infestations as restricted use areas or exotic aquatic weed control areas. This designates the infested area and restricts the use of this area from boating, fishing and other uses that may promote the spread of exotic weeds.

HB 181 will also make it unlawful to transport exotic aquatic weeds on boats, engines or trailers from any lake. The bill is extremely important because it also will provide DES with an increase in funding to complete more exotic aquatic weed treatments, to expand the Department's educational outreach program, and to provide additional control mechanisms once the exotics have been established in a particular lake.

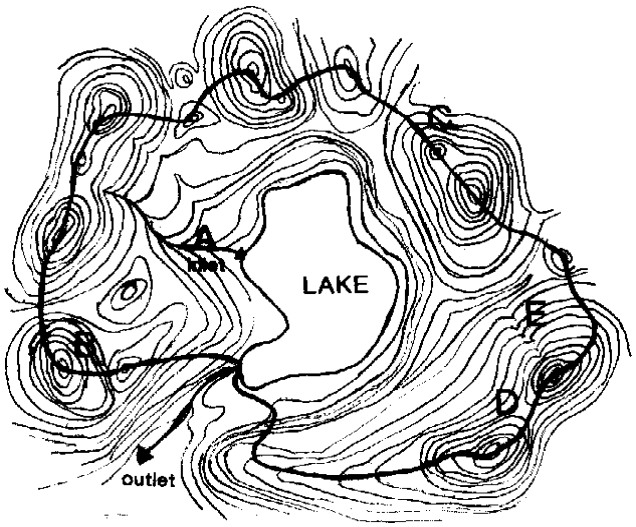
HB 181 passed the House Resource, Recreation and Development Committee 17-0 and was submitted to the Senate Environment Committee. A Senate hearing on **HB 181** was held on March 26th. All public testimony was in support of this bill and as of May 9, the Senate passed the bill unanimously. □

Limno 101: How to Draw your Watershed's Boundaries

Bob Estabrook, Biology Bureau Administrator

The watershed of a pond is all the land that drains into that pond, either directly or into other surface waters (ponds, streams, and wetlands) that drain into the pond. It is important to know the boundaries of your watershed, since any activity or development within the watershed can affect the quality of the lake you are monitoring.

All that is needed to delineate the boundary of a pond's watershed is a map showing elevation contours such as a USGS quadrangle sheet (topographic map). To draw the watershed, start at the pond's outlet, go perpendicular to the contour lines to the height of land or to a ridge that leads to the height of land; follow the height of land by connecting peaks and ridges; look at stream flow direction to see if a ridge is the watershed boundary or merely a subwatershed boundary; and continue following the height of land until completing the loop, arriving at the pond's outlet from the other side.



Some helpful hints:

1. Contour lines point upstream (A).
2. Mountain or hilltops are represented by closed loops (B).
3. Valley contour lines point toward mountain tops and are usually V-shaped (A).

Watershed boundaries never bisect a valley

4. Ridge contours point away from mountain tops and are usually U-shaped (C).

Watershed or subwatershed boundaries will bisect ridges.

5. Saddles are ridges between two mountain tops (D).

Watershed boundaries bisect saddles; the saddle also usually sits at the head of two valleys going in opposite directions.

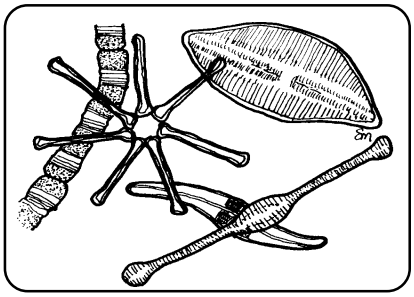
Watershed boundaries are easiest to delineate in hilly areas with many contours. In flat areas with no streams it is less easy to determine the boundary. It is sometimes helpful to think of yourself as a raindrop: "if I landed here, which way would I roll?".

□

Holistic from page 1

The Approach

The study, initiated in 1996, will look at 24 lakes initially. Two types of lakes will be examined: reference lakes (those least disturbed and with primarily forested watersheds) and assessment lakes (those with known impairments and watershed stresses). Their biological communities will be thoroughly studied, chemical tests performed, and each centimeter of their sediment cores dated and analyzed. Once the sediments and biological communities of the reference lakes are characterized, we will better understand how to quantify watershed development and known stress impacts as evidenced in assessment lakes. Ideally, we will someday be able to set standards which establish allowable impacts to lakes from development and which prevent excess development. We may even be able to better model the rate at which lakes age, or eutrophy, due to human impacts.



Interesting Highlights

Did you know that you can reconstruct environmental (lake) conditions that existed thousands of years ago by looking at the composition of diatoms in the lake sediments? Diatoms, like other algae, are microscopic plants at the the base of the lake's food chain. What makes diatoms special is the silica in their cell walls which persists as a tiny artifact even after the algae dies and settles to the lake floor. This artifact of lake life tells paleolimnologists the species and abundance of diatoms that existed in the lake 10 years ago, or even 1000 years ago. So what good is that, you ask?

First, diatoms are particularly sensitive to environmental change; therefore, only certain species of diatoms can be expected to exist in a given lake environment. Some may be sensitive to acidity, others may be sensitive to nutrient enrichment. In other words, the array of diatoms identified in a layer of sediment, along with a chemical analysis of the sediment itself, indicates the lake conditions that existed while they were living. This allows limnologists to answer questions such as: Has the lake quality changed over time? How rapidly? Did lake quality change with human settlement? Or is the change in the lake attributable to natural variability?

Similarly, pollen grains in sediments tell us about historical watershed activities and climate changes. We can even estimate when Europeans settled in the area. As settlers arrived from other areas of the world, they brought along non-native plants and trees to surround their new homes. The pollen from these new species appears at a particular depth in the sediment, which paleolimnologists can date with some accuracy.

This information together with intensive assessments of the lakes' current biological health (through investigation of the aquatic insect communities, plant populations, pollen analyses, and plankton populations) will shed light on how humans impact our lakes. And, understanding just how much stress they can handle before they are undesirably impacted will help us to ultimately become more responsible lake stewards. □

One of Eastman's Great Pleasures

Observing and Protecting our Resident Loons

Written by John Haas & Edited byHervie Haufler of Eastman Lake

Most bird books begin with the loons, for the reason that they are the most primitive of our birds. These black-and-white dagger-beaked fowl have been around, ornithologists calculate, for more than 60 million years. They were invented before birds developed the hollow honeycombed bone structures that give their bodies strength with less weight. The loon is consequently, a dense heavy bird, one that is almost as much at home under water as a fish.

Loons can live for 30 years and, it is believed, mate for life. A pair may come back and claim the same lake year after year. There has been a pair of common loons on Eastman Lake since the community's beginnings. Whether it's the same pair is a good question; some Eastmanites believe that the call of the present male differs from that of the male here several years ago, and that therefore we have a more youthful pair now inhabiting our lake.

Whoever they are, our loon pair can be expected to arrive shortly. They have an uncanny ability to judge when the ice will go out of the lake and they can safely land (loons that make the mistake of coming down on land are helpless — they need water, and lots of it, to lift their heavy bodies into flight).

Whether old-timers or newcomers, Eastman's resident pair of loons has been following the same pattern when it comes to nesting. A few times, years ago, they built nests on the big island. But after having their eggs destroyed by predators there, they have taken consistently to using the small island off

Continued on next page

continued from previous page

North Cove Beach for their nesting site. They build their nest close to the water (their short legs are so far back on their bodies that on land they can only push themselves along on their chests) and normally lay two olive-brown eggs.

Only once, in the memories of Eastmanites, have our loons hatched both eggs. That was two years ago, when we had the spectacle of twin chicks growing up on our lake. Often, when two chicks are born, only the stronger survives— the parents favor it, and the other wastes away. But either we are blessed with exemplary parents, or our second loon was more resolute: both chicks made it to maturity. One was a mama's boy always staying close for a handout from the elders; the other soon showed great independence, learning to fish for himself.

Last year, sadly, the pair hatched one chick which was seen for a few days but then probably provided a meal for a snapping turtle, a large fish or a hawk. Such is nature.

Loons are notable for their ability to vocalize. They communicate with four basic sounds: hoots, wails, tremolos and yodels. Hoots are brief, single notes that help the birds stay in contact. Wails are used when they get farther apart and want to check on each other. Tremolos are thought to signal the birds' alarm, their warnings of danger, and are the loon's maniacal "laugh" that probably coined the phrase "crazy as a loon". The yodel is the call by which the male establishes and guards his territory.

Our resident pair will be with us all summer and will, it is hoped, raise one or two chicks. Then in late fall the parents will take off and fly to winter quarters in ice-free waters. The most incredible miracle is that the youngsters will stay on their own until just before the lake freezes over and then also fly away, somehow knowing by instinct where to go.

While loons are having their troubles surviving in other places, New Hampshire is seeing its loon population on the rise. This happy trend is due in part to the efforts of conservation groups working with the state's Audubon Society and the Loon Preservation Committee. During nesting season each spring Eastman's own Loon Rangers, led by Millie Corwith, organize to put out warning buoys around the loons' island and to watch over the site on weekends. It is the group's hope that Eastman owners, visitors and renters will respect our loons and refrain from venturing too close either to the birds or to their nests.

Eastman Lake's loons supply a unifying theme to our whole community. Although we may have differences of opinion on other matters, we generally agree that having our loons return each year, making themselves visible as they dive and fish, and filling our nights with their eerie calls is one of the pleasures of living at Eastman. □

Luring the Loons

Stephanie Moses, NHVLAP Coordinator

A number of people have wondered, "How can I get loons to come to *my* lake?". Research on the behavior of loons suggests there are a number of factors which influence a loon's choice of nesting site.

Loons prefer a fairly large or isolated territory for nesting. Lakes between 15 and 200 acres may support only a single pair of loons, unless the lake has physical barriers to visually separate pairs (bays or islands). They prefer lakes or areas undisturbed by human recreation and protected from wind and wave action. (Because nests must be close to the water, too much wave action onto the shore can flood a nest). The depth of the lake does not seem to be an overly important feature. Ideally loons would prefer lakes with varied features: "rocky shoals" to feed over, marshy safe areas for raising their young, steeper shorelines for nest location (so they can slide into the water), and deeper areas for social interaction.

Loons are visual predators. Therefore, water clarity should be between 2.5 and 5 meters or more for successful fishing. Similarly, turbidity from recreation or streams can also hinder the loons ability to see underwater and find food. The loons can compensate for such conditions somewhat by hunting in shallower areas where the lake bottom is visible. (Did you know that a pair of loons and two chicks will consume over a ton of fish in the 15 week chick-rearing period?!)

Once the loons take a liking to your lake, most pairs will return year after year (provided they are not forced to abandon the nest due to disturbance or predation; this is why islands and nesting platforms have been so successful as nest sites). For more information on loons, please contact the Loon Preservation Committee at (603) 476-LOON (5666).

The Great American Secchi Dip-In

Jody Connor, Limnology Center Director

For the third year in a row, New Hampshire volunteer monitors have participated in the Great American Secchi Dip-In. Although the number of lakes sampled by volunteers slipped from 101 in 1995 to 87 in 1996, New Hampshire ranked sixth in North America for program participation. Minnesota volunteers ranked first in participation with 507 Secchi dippers.

As you may know, Secchi depth transparency is an important lake quality and trophic state indicator that is affected by the lake color, algal abundance, and suspended solids. High transparency values often correlate with less productive, oligotrophic lakes, while low values usually correlate with highly productive, eutrophic lakes.

The collection of lake quality data in New Hampshire by volunteer monitors has been one of the most popular and cost-effective programs at the Department of Environmental Services. With 800 public waterbodies throughout the state and only eight aquatic biologists, the monitoring of lake trends is a difficult task. The contribution of quality data from volunteers has been essential in helping limnologists define lake quality trends as well as identify nonpoint sources of pollution to lakes, exotic weeds, and lakes with fish that contain elevated mercury. The nationwide volunteer groups contributing to the "Dip-In" point out that New Hampshire volunteers are not alone in their dedication to quality water resources and their quest to protect our nation's lakes.

State	Average Transparency (m)	Range	Number of Participants
Maine	5.87	.07 - 14.6	121
Montana	5.74	1.25 - 12.0	45
New Hampshire	5.1	1.05 - 10.8	87
Vermont	5.06	1.00 - 11.23	27
Washington	3.76	.04 - 8.53	68
Michigan	3.73	.61 - 10.67	209
Nova Scotia	3.56	.92 - 7.01	58
Minnesota	3.31	.23 - 15.85	507
Wisconsin	3.22	0.25 - 9.14	372
Ontario	2.71	0.4 - 8.75	134
Massachusetts	2.69	0.48 - 10.9	69
Rhode Island	2.36	0.59 - 5.03	25
New York	2.3	0.15 - 7.1	82
Indiana	2.29	0.15 - 6.55	45
Connecticut	1.91	0.69 - 4.5	7
Georgia	1.76	.05 - 4.24	66
Illinois	1.3	.27 - 4.27	70
Virginia	1.08	.08 - 8.0	38
Ohio	1.07	.17 - 6.1	50
Florida	0.65	.04-2.3	65

According to the results of the survey accompanying the 1996 Dip-In activities, 2000 volunteers from thirty-eight states responded. As reported by Bob Carlson, responding volunteers were concerned with algae, weeds, silt and watercraft such as boats and jetskis. Participants made it clear that activities such as boating, waterskiing, jetskis, compliance with laws and noise are all important considerations in their perception of water quality, not uncommon to what we hear from lake users in New Hampshire.

Results from the three-year program suggest that the perception of water quality is regionally biased. Carlson suggests that people become accustomed to the prevailing conditions of the lakes in a particular region, and therefore consider the lakes in that region to be in good condition, regardless of the lake transparency. Those of us who frequent New Hampshire lakes (mean Secchi reading = 5.1m) may find a Florida lake (mean Secchi reading = 0.9m) less appealing to swim in — or maybe it's the fear of lurking gators that make swimmers leery of taking that dip.

A list of all the states and provinces with 25 or more participants are ranked in order of decreasing mean transparency. As you can see, New England has three states ranked in the top five for the highest mean transparencies. Although New

See Secchi on page7

Shoreland Protection Rules Updated

Stephanie Moses, NHVLAP Coordinator
Edited by Natalie Landry, Shoreland Coordinator

The New Hampshire Comprehensive Shoreland Protection Act (RSA 483-B) became effective in its entirety in 1994. The goal of the Act is to protect our lakes and ponds from harmful or unsightly shoreland development. Since the Act went into effect, administrative rules have been adopted to "interpret the statutes" and to "create enforceable provisions". In other words, rules allow DES to define specific regulations, clarify mandates in the law, and define terms in the law.

To keep you informed, I have highlighted some of the Shoreland Protection Rules below. Please remember that these are not *all* the Rules; a complete copy of the Rules and the Act can be obtained from the DES Public Information Office at 271-3503 for a $3.00 fee. The Rules were adopted in November 1996.

Openings for Building Construction: The maximum opening (or building envelope) allowed is 25 feet (or 15 feet if the structure is located between the high water mark and the primary building line) from roads, driveways, septic systems and all major structures; openings for accessory structures (e.g., gazebos, sheds, wells) are defined as the area extending 10 feet from the structure's perimeter. The property owner shall stake any building opening in the field.

Accessory Shoreland Structures: structures cannot exceed 20 feet in height or have a footprint larger than 150 square feet; all accessory structures must be set back at least 20 feet from the high water mark unless they require direct access to the water (such as docks, piers, boathouses, wells, etc); and no structure can be placed on land sloping greater than 25%.

Nonconforming Structures (applies to existing structures not in compliance with local zoning and/or Shoreland Protection regulations): structures damaged by accidental means must be replaced, removed, or repaired within one year of accident; those damaged by means other than accidental, if replaced, shall be set back at least as far as the primary building line (50 feet from high water mark); and decks and porches located between the primary building line and the high water mark cannot be converted to primary living space in the structure.

The Rules also outline variance application procedures as well as fines for violations of the Act. The appendix to the rules even lists common native and naturalized plantings suitable for shoreland plantings. Please help us pass along knowledge of the Shoreland Protection Act to all our lakeshore residents! Feel free to reproduce this information in your association newsletter or local newspaper.

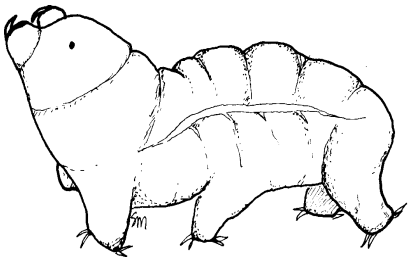
Secchi continued from page 6

Hampshire lakes remained relatively stable in transparency from 1995, it moved from fifth in the ranking to third, because Vermont slipped in mean Secchi Dip-In transparency from 5.7 in 1995 to 5.06 in 1996. Maine and New Hampshire also rated fifth and sixth respectively for program participation.

Bob says, "Yes, there will be a 1997 Dip-In." Funding again is limited so that only lakes and reservoirs will be asked to participate. The 1997 Secchi Dip-In should occur between June 27 and July 13 — mark your calendar! Let's make it a goal to increase participation in 1997 over the 1996 level. Does anyone out there want to volunteer to Dip-In at Caldwell Pond in Alstead or Russell Pond in Woodstock? These are the lakes in New Hampshire with the highest transparency (17m or 55 feet). □

What's Lurking in *Your* Lake?

Ken Warren, Coordinator, Exotic Weed Control Program



When one thinks about the living organisms that inhabit a typical New Hampshire lake, most will conjure up thoughts about the big fish that got away, those cute little painted turtles basking on a rock in the sun, or the assortment of worthless biting, bloodsucking insects.

But did you know that these lakes are also home to such exotic sounding things as *jellyfish, sponges, eels, water fleas, water scorpions, horsehair worms, water bears, carnivorous plants* and basketball sized jelly masses called *Bryozoans*? Don't worry, no one has ever been attacked or consumed by these relatively unknown lake residents.

Probably, the most interesting of the list are the sponges, jellyfish and Bryozoans. Freshwater sponges are usually pencil shaped green structures attached to underwater brush or logs. They can also be shapeless green "spongy" masses covering rocks. Their green coloration usually comes from encapsulated algae cells. Filtering organic matter from the water is their method of feeding. If you pick one up you will notice a pungent swampy odor.

Transparent jellyfish are the size of a half dollar and are rarely seen even by a seasoned aquatic biologist. When they do show up, many thousands can be found. In most cases, they exist in the polyp stage on the bottom of the lake, out of our sight. They are harmless and quite a treat to see in great numbers.

Bryozoans are gelatinous colonies made up of minute individual animals called "zooids". The entire colony can be found usually attached to logs, brush, or overhanging tree limbs submerged in the water. At first glance, most people are hesitant to ever get near the "alien" looking mass of brownish jelly. Most of these colonies are the size of grapefruits, while some can get much larger.

So what are all these critters good for, you ask? They, like the other hundreds of unnoticed water organisms contribute to the success of a balanced diverse ecosystem.

By the way, I have never seen a waterbear in the flesh. □

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NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Water Division
Biology Bureau
New Hampshire Volunteer Lake
Assessment Program
PO Box 95
Concord, New Hampshire 03302-0095
(603) 271-3503

Editor
Stephanie A. Moses

Robert W. Varney
Commissioner

George Dana Bisbee
Assistant Commissioner

Edward J. Schmidt, P.E., Ph.D.
Director, WaterDivision

Robert Estabrook
Administrator, Biology Bureau

Jody Connor
Limnology Center Director

Stephanie A. Moses
Volunteer Lake Assessment Program
Coordinator, Editor, & Illustrator

Scott Ashley
Data Management & Computer Coordinator

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New Hampshire Department of Environmental Services
Water Division, Biology Bureau
P.O. Box 95, 6 Hazen Drive
Concord, New Hampshire 03302-0095

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